

## CLAIMS

What is claimed is:

1. A method for processing a food product comprising transporting said food product through a plurality of stations including a pasteurization station, pasteurizing the surface of said food product at said pasteurization station by condensing steam on said surface.
2. The method according to claim 1 comprising surface pasteurizing a non-packaged said food product in a pressurized chamber.
3. The method according to claim 1 comprising retarding the onset of film condensation by removing condensate film from said surface.
4. The method according to claim 3 comprising condensing steam on said surface in dropwise condensation, and removing said condensate film as soon as it forms on said surface, such that condensation is substantially only dropwise condensation and not film condensation.
5. The method according to claim 1 comprising removing condensate film from said surface with directional jets.
6. The method according to claim 5 comprising applying high velocity steam from said jets physically displacing said food product and applying steam to the entire outer surface of said food product.
7. The method according to claim 6 wherein said stations include a loading station loading said food product in a package prior to said pasteurization station, and comprising physically displacing and lifting said food product from said package at said pasteurization station with high velocity steam from said jets to enable application of steam to the entire outer surface of said food product.
8. The method according to claim 6 wherein said stations include a loading station loading said food product in a package prior to said pasteurizing station, and comprising inducing movement of said food product in said chamber at said pasteurization station with high velocity steam from said jets to enable application of steam to the entire outer surface of said food product.

9. The method according to claim 1 wherein said stations include a loading station loading said food product in a package prior to said pasteurization station, and comprising also applying said steam to said package at said pasteurization station.

10. The method according to claim 9 wherein said food product comprises longitudinally extending tubular members, and wherein said package is supported on a surface having ridges extending transversely to said longitudinally extending tubular members to minimize surface area contact therewith and  
5 maximize exposure of said longitudinally extending tubular members to said steam.

11. The method according to claim 9 wherein said food product comprises longitudinally extending tubular members, and said package is supported on a surface having a plurality of ridges extending longitudinally parallel to said tubular members.

12. The method according to claim 9 wherein said package is supported in an inverted position on a form-inverter at said pasteurization station.

13. A method for processing a food product comprising transporting said food product through a plurality of stations including a pasteurization station, pasteurizing the surface of said food product at said pasteurization station by applying a pasteurizing medium to said food product at  
5 said pasteurization station and convectively transferring heat from said pasteurizing medium to the surface of said food product at a sufficiently high heat transfer rate such that the surface heat transfer coefficient becomes sufficiently higher than the food product conductance coefficient that the surface temperature is substantially instantaneously elevated above temperatures which are instantly  
10 lethal to microbes which may be present.

14. The method according to claim 13 wherein exposure time of said surface of said food product to said pasteurizing medium at said sufficiently high heat transfer rate is less than or equal to 5 seconds.

15. The method according to claim 13 comprising applying said pasteurizing medium to said surface of said food product with directional jets, and directing said pasteurizing medium at high enough velocity to physically displace said food product and apply said pasteurizing medium to the entire outer surface of said food product.

16. The method according to claim 13 wherein said stations include a loading station loading said food product in a package prior to said pasteurization station, and comprising also applying said pasteurizing medium to said package at said pasteurization station.

17. A method for processing a food product comprising transporting said food product through a plurality of stations including a loading station, a pasteurization station, and a closing station, said loading station loading said food product in a package, said pasteurization station pasteurizing the surface of said food product after said loading station, said closing station closing said package with said food product therein after said pasteurization station.

18. The method according to claim 17 comprising closing said package with said food product therein immediately after said pasteurization, with no processing steps between said pasteurization station and said closing station.

19. The method according to claim 17 comprising pasteurizing both said food product and said package at said pasteurization station.

20. The method according to claim 19 comprising closing said package at said closing station with a cover, and sterilizing said cover independently of said pasteurization.

21. The method according to claim 17 comprising pasteurizing said food product at said pasteurization station with a pasteurizing medium, and directing said pasteurizing medium at said food product at high velocity to physically displace said food product from said package and apply said pasteurizing medium to the entire outer surface of said food product.

22. The method according to claim 17 wherein said pasteurization station includes a chamber having first and second distal ends, and comprising flowing a pasteurizing medium across said food product by introducing said pasteurizing medium at said first distal end and venting said pasteurizing medium at said second distal end.

23. The method according to claim 22 comprising cyclically and alternately reversing the supply and venting of said pasteurizing medium at said first and second distal ends to provide alternating direction flow of pasteurizing medium across said food product and provide a pulsing effect of said flow.

24. The method according to claim 22 wherein said pasteurizing medium is steam which condenses on said food product to condensate, and comprising venting both steam and condensate from said chamber.

25. The method according to claim 17 comprising providing said pasteurization station with a chamber having first, second and third ports, and comprising providing a first flush mode introducing pasteurizing medium at said first port and venting said pasteurizing medium at at least one of said second and third ports, providing a second flush mode introducing pasteurizing medium at said second port and venting said pasteurizing medium at at least one of said first and third ports, and providing a third flush mode introducing pasteurizing medium at both of said first and second ports and venting said pasteurizing medium at said third port.

26. The method according to claim 25 comprising providing said third port between said first and second ports, and

during said first flush mode, flowing said pasteurizing medium in a first direction across said food product,

during said second flush mode, flowing said pasteurizing medium across said food product in a second direction opposite to said first direction, and

during said third flush mode, flowing said pasteurizing medium in each of said first and second directions to said third port.

27. The method of according to claim 25 comprising providing said third port between said first and second ports, and  
during said first flush mode, flowing said pasteurizing medium in a first direction across said food product,  
5 during said second flush mode, flowing said pasteurizing medium across said food product in a second direction opposite to said first direction, and  
during said third flush mode, flowing said pasteurizing medium in each of said first and second directions from said third port.
28. The method according to claim 17 comprising providing said pasteurization station with a chamber having first, second and third ports, said third port being between said first and second ports, and comprising providing a flush mode introducing pasteurizing medium at said third port and venting said  
5 pasteurizing medium at at least one of said first and second ports.
29. The method according to claim 17 wherein said food product is one or more hot dogs each extending longitudinally between first and second wrinkled ends, and comprising introducing pasteurizing medium at said pasteurization station to each of said first and second wrinkled ends, and flowing  
5 the pasteurizing medium longitudinally along said hot dog.
30. The method according to claim 29 comprising initially introducing said pasteurizing medium to each of said first and second wrinkled ends and then flowing said pasteurizing medium longitudinally along said hot dog.
31. The method according to claim 29 comprising initially flowing said pasteurizing medium longitudinally along said hot dog and then to said first and second wrinkled ends.
32. The method according to claim 29 comprising introducing said pasteurizing medium alternately at said first and second wrinkled ends.
33. The method according to claim 29 comprising introducing said pasteurizing medium simultaneously at said first and second wrinkled ends.

34. The method according to claim 17 wherein said pasteurization station includes a pressure vessel chamber, and comprising introducing pressurized pasteurizing medium into said chamber to pasteurize said food product.

35. The method according to claim 34 comprising processing said food product at said pasteurization station by closing said chamber, introducing pressurized pasteurizing medium into said chamber to pasteurize said food product, and venting said pasteurizing medium from said chamber and depressurizing and opening said chamber.

36. The method according to claim 35 comprising opening said chamber prior to complete depressurization thereof such that said chamber is opened while some residual pressure still remains in said chamber, thereby decreasing cycle time to increase throughput rate.

37. The method according to claim 17 comprising pasteurizing said food product with steam which condenses on said food product to condensate, and comprising immediately after pasteurization with said steam, removing excess moisture from said food product with high velocity sterile air prior to closing of said package at said closing station.

38. A method for processing a non-encased food product comprising surface pasteurizing said non-encased food product in a pressurized chamber by introducing a pasteurizing medium into said chamber and venting said pasteurizing medium from said chamber at a slower outflow rate than the inflow rate of said pasteurizing medium into said chamber such that pressure in said chamber increases, to increase the temperature of said pasteurizing medium to an effective temperature for killing bacteria.

39. The method according to claim 38 comprising providing a sufficiently faster inflow rate of said pasteurizing medium into said chamber relative to the outflow rate of said pasteurizing medium and condensate to build pressure in said chamber to a range of 10 to 60 psig.

40. The method according to claim 38 comprising providing first and second ports into said chamber, providing a first cycle and inflowing said pasteurizing medium into said chamber through said first port and venting said pasteurizing medium from said chamber through said second port at a slower  
5 outflow rate than the inflow rate through said first port in said first cycle, providing a second cycle and inflowing said pasteurizing medium into said chamber through said second port and venting said pasteurizing medium from said chamber through said first port at a slower outflow rate than the inflow rate of said pasteurizing medium into said chamber through said second port in said second cycle, such that  
10 pressure builds in said chamber in each of said first and said second cycles.

41. The method according to claim 38 comprising providing first and second ports into said chamber, and providing a pasteurization cycle continuously flowing said pasteurizing medium into said chamber through said first port and continuously venting said pasteurizing medium from said chamber  
5 through said second port to provide continuous flow of said pasteurizing medium across said food product during said pasteurization cycle without sealing said chamber against outflow or otherwise blocking venting of said pasteurizing medium from said chamber during said pasteurization cycle.

42. The method according to claim 41 wherein said pasteurizing medium is steam, and said continuous flow strips away steam film condensate from said food product, enhancing heat transfer.

43. The method according to claim 38 comprising supplying said pasteurizing medium to said chamber during a pasteurization cycle, and immediately after said pasteurization cycle, providing a vacuum cooling step removing said pasteurizing medium from said chamber and vacuum cooling said  
5 food product by evaporative cooling, namely by evaporation of condensate.

44. The method according to claim 38 comprising surface pasteurizing said food product with dual chamber heat treatment comprising providing a first said pressurized chamber and pasteurizing said food product with

condensing steam therein, and transferring said food product to a second  
5 pressurized chamber and pasteurizing said food product with super heated steam in  
said pressurized second chamber.